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The use of Myxomycete plasmodia for instructional purposes

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During the progress of some studies on slime molds the writer has had opportunity to use the plasmodia for purposes of instruction in botany and biology classes. For studying the general characteristics and properties of protoplasm, and protoplasmic streaming, this material is, in my opinion, very much better than materials which have been commonly utilized for these purposes. This account of the writer's methods of collecting, preserving and preparing plasmodia for classroom use is presented with the hope that other teachers may find the information interesting and useful.

It is well known that the plasmodia of slime molds consist of naked, multinucleate, mobile masses of protoplasm which may be found inhabiting decaying wood and other organic matter. They are found most frequently in the warm seasons and in very moist or wet habitats. Those which inhabit rotting wood are usually found only in the interior of the wood while they are vegetating actively. Usually they emerge only at the time of fructifying. The plasmodia of many of the most common and widely distributed species are either pink or yellow and the fact that they are rather highly colored facilitates finding them on their natural substrata.

In collecting plasmodia it is well to be provided with a collecting case or vessel in which pieces of moist, rotten wood can be carried without danger of excessive drying. The ordinary vasculum serves the purpose very well. In addition to a collecting case, a hand-axe or some similar tool, with which decaying logs and stumps can be cut and broken, will be very useful. The writer has found plasmodia most frequently by examining the interior of stumps and logs located so that they are partially

submerged in water or at least where they are kept more or less constantly moist. The reticulated plasmodia may be found penetrating and distributed throughout fairly large portions of the wood. Wood containing the protoplasmic reticulum may be cut or broken into pieces of almost any size, suitable for carrying in a collecting case, without danger of serious or permanent damage to the plasmodial material.

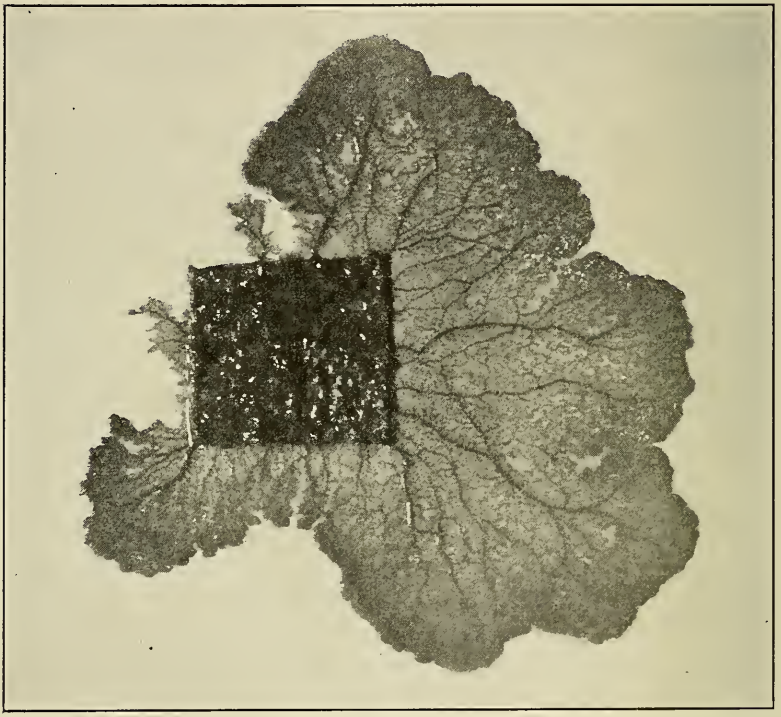

Fig. 1. A plasmodium in the process of emerging from a sclerotium and spreading over the surface of an agar plate.

Many living plasmodia, which have been collected in this way, may be kept in the laboratory for weeks or even months by simply placing the wood on which they are growing in a vessel where it can remain constantly moist. However, the habit of some of the Myxomycetes of forming sclerotia or resting stages can be utilized advantageously in preserving viable

material and obviates the necessity of culturing or maintaining vegetative plasmodia for future use. One convenient method of obtaining sclerotia is as follows: Place some decaying wood, in which a plasmodium is growing, on absorbent paper which can be moistened and kept moist. In the course of time, some part or all of the plasmodium will creep from the wood to the surface of the paper and after this has occurred the wood may be removed.

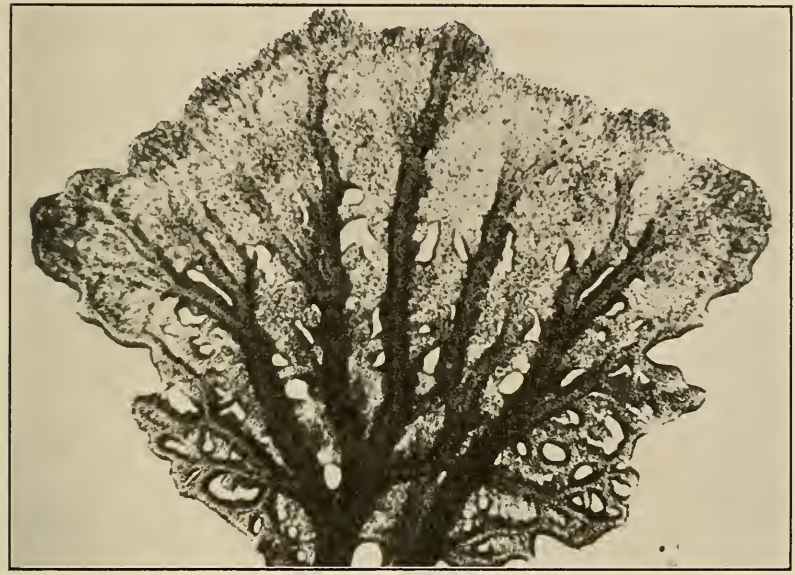

Fig. 2. A photomicrograph of a portion of a plasmodium showing the thick vein-like channels along which rapid protoplasmic streaming takes place.

Following this, the plasmodium is subjected to gradual dessication by leaving the paper to which it is clinging under a bell jar or similar vessel. This vessel should be provided with a small opening through which a slow exchange of gases can take place between the atmosphere of the vessel and the external atmosphere. The optimum rate of dessication is unknown but the writer has found it effective to allow about twenty-four hours for completion of the process. If dessication is too rapid horny non-viable masses are formed. In the process of sclerotization plasmodia collect into more or less compact masses and cleave into roundish or polyhedric cells. When fully formed, the sclerot-

ial masses are hard and brittle and they may be broken into small pieces without danger of damage. When afforded proper conditions of moisture and temperature living plasmodia will emerge from sclerotia or sclerotial fragments.

In preparing material for class use the writer places pieces of sclerotia on the surface of one per cent, non-nutrient agar which has been poured into petri dishes. At room temperature plasmodia emerge from the sclerotia within a few hours (fig. 1). The lids of the petri dishes may be removed for periods of several minutes without risk of excessive drying and the plasmodia can be examined and observed both with and without a microscope.

As observed with the unaided eye plasmodia can be seen to change their position on the substrata and their conformation more or less continuously. Thus it is seen that they are endowed with powers of locomotion and exhibit a creeping movement. As viewed with a microscope, they are seen to consist of granular protoplasm containing numerous inclusions and vacuoles. This protoplasm exhibits a systemic circulation but the protoplasmic movement is most noticeable in the thicker channels and veins of the plasmodial sheet or reticulum (fig. 2). Through these veins and channels the protoplasm streams in a very rapid current which gradually comes to a pause in the space of a short time, and then immediately reverses its course. A rhythmic backward and forward flow is thus maintained, but it can be observed to flow longer in one direction than in the other. The flowing movement is generally of longest duration in the direction in which the plasmodium is creeping.

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